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Producer willingness and ability to supply biomass: Evidence from the U.S. Midwest

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ABSTRACT

Producer willingness and ability to supply biomass could be a key barrier to bioenergy and bioprocessing industries. In this paper we investigate and compare the willingness to supply biomass in two areas in the U.S. Midwest: mid Missouri and southern Illinois. In addition we take into consideration their ability and capabilities to provide biomass to bioenergy processors by comparing their existing assets and their willingness to provide critical services such as transport and storage. Results indicate that mid Missouri producers had higher willingness to supply at moderate price levels. However, under ideal circumstances such as higher prices, southern Illinois producers would supply more than Missouri producers. Willingness to supply results varied across crops and price levels. However, comparable categories were fairly consistent. For instance, Illinois and Missouri producers would potentially supply about 40 percent and 32 percent of their corn stover to biomass processors, under ideal conditions. These types of estimates provide important information for feasibility and economic impact studies.

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1. Introduction

Interest in renewable energy from biomass has increased in recent years. This interest has been driven by local and global environmental concerns, domestic energy security, land use tradeoffs between food and energy as well as potential rural development benefits from biomass production and processing. However, the basic financial feasibility of bioenergy production is influenced by producers' willingness and ability to supply biomass at prices that make it profitable for processors to utilize nascent technologies to convert biomass to energy for markets such as transportation fuels and power sectors.

In this paper we compare survey results from two potential biomass areas in the U.S. Midwest: mid Missouri and southern Illinois. The focus is on producer willingness to supply existing biomass products: cereal straw, corn stover and surplus hay. The results also include producers' ability to supply

biomass by investigating the existing assets producers own that could support bioprocessing industries as well as the services producers may be willing to provide such as transportation and storage.

More specifically, the survey attempts to reveal answers to the following questions. Do producers have the assets to support a biomass based energy industry or will producers be required to make new investments? Are producers willing to provide the necessary services to support a local bioenergy industry such as transportation and storage services or will processors be better served by utilizing the services of non-local custom contractors for services? Overall, what proportion of their current biomass products will biomass producers be willing to sell to bioenergy processors and are there differences between regions?

The results show that the willingness to supply services in the different geographic areas to be fairly similar while the

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current asset ownership to be somewhat different with mid Missouri having more capabilities when it comes to baling and southern Illinois producers having more capabilities considering transport equipment. Willingness to supply variables show more statistical differences when considering straw and stover while the willingness to supply hay is not statistically different under ideal conditions. Results also indicate that mid Missouri producers have a higher willingness to supply at relevant price levels; although under ideal theoretical conditions such as optimal agronomic factors like soil and weather conditions as well as higher prices, southern Illinois producers had a higher willingness to supply.

2. Biomass and bioenergy literature

Here we provide a literature review to place our paper into context, for a more full literature review see Tyndal, Berg, and Colletti [1]. The biomass and bioenergy literature includes techno-economic feasibility studies that include variations in process technology. The pathways to process biomass include biological, chemical, thermal and physical [2]. Since the mid 1990s biological pathways such as enzymatic hydrolysis have been shown to be cost competitive with corn ethanol and more environmentally sustainable than leading chemical pathways using acidic hydrolysis [3,4]. Physical processes have been shown to be most effective in pretreatment stages, while thermal processes tend to be more mature and the basis of the current U.S. biopower industry [5].

Even though some feasibility studies show cellulosic ethanol could be feasible, the empirical evidence suggests that the growth of the industry has been limited. Growth beyond the pilot plant stage has not occurred and the long term potential for maturity and to emerge from premature commercial development seems to always be 5 years in the future. To this point in the development of cellulosic ethanol, little commercial production has occurred beyond pilot and demonstration plants. Thus the relevant economic research turns toward the various barriers to economic feasibility.

Technical barriers to cellulosic ethanol include the processing technology. Various commercial, government and academic institutions have developed intensive research agendas to identify and solve the various technology based questions.

Non-technical barriers are less well understood. Among these logistics, organization and producer willingness to supply questions are paramount. Altman and Johnson (2009)

Table 1 – Producer Assets-Missouri.

Variable	Observations	Frequency of Affirmative Response	Percent
Round baler ownership	551	340	61.7%
Tractor ownership	548	493	90.0%
Square baler ownership	545	59	10.8%
Baling experience	545	471	86.4%
Truck and trailer ownership	547	362	66.2%

Table 2 – Producer Services-Missouri.

Variable	Observations	Frequency of affirmative response	Percent
Windrowing	558	187	33.5%
Baling	558	244	43.7%
Storing	558	201	36.0%
Delivering	558	212	38.0%

investigate organizational structure of current and future biomass industries and consider the impact of scale on organizational decisions in the current biopower industry [6]. Supply chain development, an oft-overlooked aspect of the biopower industry—is considered by [7], who also find that the nature of supplier contracts may also impact the development of the industry.

In the area of willingness to supply various approaches have developed. Indirect approaches include modeling producer's costs of production in various areas and estimate prices to cover their opportunity costs [8]. Other indirect approaches model the profitability of typical farms if they convert to biomass production under various assumptions such as risk and contract type [9]. More direct approaches include the surveying of producers in order to estimate the willingness of producers to convert land to intentionally grown energy crops such as fast growth trees such as hybrid willow and poplar or perennial grasses such as switch grass and miscanthus [10].

In this paper we investigate the willingness of producers in two Midwestern States, Missouri and Illinois, to supply existing biomass products—cereal straw, corn stover and hay—to hypothetical processors. We take a direct approach by surveying producers' willingness to supply at 3 price levels with various producer characteristics. In addition we investigate the producers' willingness to provide services by investigating their current assets. The two geographic areas are compared to determine whether there are meaningful differences across alternate production areas.

3. Survey data

The data set for this paper rely on two separate surveys of producers in mid Missouri and southern Illinois conducted by the Southern Illinois University and the University of Missouri. In January and February of 2007 the Missouri survey was conducted and then in January and February 2009 the Illinois survey was conducted. Both surveys were similar in structure breaking questions down into production, assets and activities, marketing and demographics.

Table 3 – General Willingness to Supply-Missouri.

Variable	Observations	Mean	Std. Dev.	Min	Max
Straw	416	38.1%	41.4%	0%	100%
Stover	400	32.5%	39.9%	0%	100%
Hay	431	21.5%	33.4%	0%	100%

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